

CLAIMS

We Claim:

1. A phase locked loop having a binary quantized phase detector,
comprising:
 - a first means for storing a reference threshold value;
 - a comparator having a first input for receiving a first input signal and a second input for receiving the reference threshold value, the comparator comparing the first input signal with the threshold value to generate an output; and
 - in a set threshold block, comprising:
 - an integrator, coupled to the second means, for locating a cross point in a data-eye diagram of data sequence, having an input for receiving the output from the comparator and an output for generating a new threshold value.
2. The phase locked loop of Claim 1, wherein the comparator produces outputs whose average value is not 0.
3. The phase locked loop of Claim 2, the set threshold block further comprising a second means for generating a constant value for level shifting the output from the comparator to produce an output whose average value is 0.
4. The phase locked loop of Claim 3, wherein the output of the second means is coupled to the input of the integrator.

5. The phase locked loop of Claim 1, further comprising a third means for filtering the quantized output, having a first input for receiving the quantized output and an output coupled to the integrator.

6. The phase locked loop of Claim 5, further comprising a fourth means for determining if two values are not equal, having a first input for receiving a first input signal, a second input for receiving a second input signal, and an output coupled to a second input of the third means.

7. A method for eliminating dead zone in a binary quantized phase detector, comprising:

- receiving a signal for a data sample in a wandering interval caused by a dead zone;
- comparing the value of the signal to a reference threshold value, thereby producing an output value;
- integrating the output value, thereby producing an integrated value; and
- setting the integrated value as the new reference threshold value.

8. The method of Claim 7, wherein the receiving step, comprising: after the threshold setting step, restarting with the new threshold value.

9. The method of Claim 7, wherein the comparing step produces an output whose average value is not 0.
10. The method of Claim 9, further comprising: after the comparing step, level shifting the output value, thereby producing an output whose average value is 0.
11. The method of Claim 7, wherein the integration comprises a scale factor.
12. The method of Claim 11, wherein the scale factor comprises adjusting to a pre-determined sampling precision.
13. A method for Claim 7, wherein the reference threshold value is originally set to 0 as a starting value.
14. A method for eliminating dead zone in a binary quantized phase detector, comprising:
- referencing a reference data sample to locate a center of a first eye in a data-eye diagram;
 - receiving a first signal for a first data sample in the first center of the first eye;
 - receiving a second signal for a second data sample in the wandering interval caused by a dead zone;

using the reference data sample to locate a center of a second eye in the data-eye diagram;

receiving a third signal for a third data sample in the center of the second eye;

applying a first comparison to the value of the second signal and a reference threshold value;

applying a second comparison to the value of the first signal and a first reference constant;

applying a third comparison to the value of the third signal to a second reference constant; and

applying a function to the results of the second comparison and the third comparison, determining if the two comparison results are equal.

15. The method of Claim 14, wherein the two comparison results differ.

16. The method of Claim 15, further comprising: after applying the function, integrating the output result of the first comparison.

17. The method of Claim 16, further comprising: after the integrating step, setting the second signal as the new reference data sample.

18. The method of Claim 16, further comprising: after the integrating step, setting the result of the integration as the new reference threshold value.

19. The method of Claim 18, wherein the referencing step, comprising: after the reference setting steps, restarting with the new reference data sample and reference threshold value.

20. The method of Claim 14, wherein the two comparison results are equal.

21. The method of Claim 20, further comprising: after applying the function, setting the second signal as the new reference data sample.

22. The method of Claim 21, wherein the referencing step, comprising: after the reference setting step, restarting with the new reference data sample.

23. The method of Claim 14, wherein the first comparison step produces an output whose average value is not 0.

24. The method of Claim 23, further comprising: after applying the first comparison, level shifting the output of the first comparison to produce an output whose average value is 0.